

CLAIMS

What is claimed is:

1. A protected network, comprising:

a plurality of primary nodes interconnected by a set of pre-provisioned working path segments between a source and a destination; and

a plurality of backup nodes interconnected by a set of pre-provisioned protection path segments between the source and the destination, each backup node also being interconnected with an associated one of the primary nodes by a corresponding one of a set of pre-provisioned, bidirectional shunt segments;

wherein:

each primary node is operative, (i) under normal working circumstances, to direct input traffic from an upstream working path segment to a downstream working path segment, (ii) upon occurrence of a failure on the upstream working path segment, to direct input traffic from an input shunt segment to the downstream working path segment, and (iii) upon occurrence of a failure on the downstream working path segment, to direct input traffic from the upstream working path segment to an output shunt segment; and

each backup node is operative, (i) upon occurrence of a failure on the downstream working path segment of the associated primary node, to direct input traffic from an input shunt segment to a downstream protection path segment, and (ii) upon occurrence of a failure on the upstream working path segment of the associated primary node, to direct input traffic from an upstream protection path segment to an output shunt segment.

2. A protected network according to claim 1, wherein each backup node is further operative, upon occurrence of a failure of the

3 associated primary node, to direct input traffic from an upstream
4 protection segment to a downstream protection path segment.

1 3. A protected network according to claim 1, wherein the working
2 segments, protection segments, and shunt segments comprise
3 label-switched paths.

1 4. A protected network according to claim 1, wherein each primary
2 node is associated with a different one of the backup nodes.

1 5. A protected network according to claim 1, wherein at least two
2 of the primary nodes are associated with the same one of the
3 backup nodes and interconnected thereto by corresponding ones of
4 the shunt segments.

1 6. A protected network according to claim 1, wherein each primary
2 node is directly connected to the associated backup node without
3 any intervening nodes capable of terminating network segments.

1 7. A protected network according to claim 1, wherein the
2 destination is a first one of at least two destinations for
3 traffic generated by the source, and further comprising (i) an
4 additional primary node interconnected by additional
5 pre-provisioned working path segments between a branching one of
6 the primary nodes and a second one of the destinations, and
7 (ii) an additional backup node interconnected by additional
8 pre-provisioned protection path segments between a branching one
9 of the backup nodes and the second destination, the additional
10 backup node also being interconnected with the additional primary
11 node by a corresponding additional shunt segment, and wherein the
12 additional primary and backup nodes and the branching primary and
13 backup nodes are respectively operative in a manner similar to the

14 other primary and backup nodes to effect protection switching of
15 traffic from the source to the second destination.

1 8. A method of operating a protected network including a plurality
2 of primary nodes interconnected by a set of pre-provisioned
3 working path segments between a source and a destination,
4 comprising:

5 interconnecting a plurality of backup nodes by a set of pre-
6 provisioned protection path segments between the source and the
7 destination, and further interconnecting each backup node with a
8 corresponding one of the primary nodes by a corresponding one of a
9 set of pre-provisioned, bidirectional shunt segments;

10 at each primary node, (i) under normal working
11 circumstances, directing input traffic from an upstream working
12 path segment to a downstream working path segment, (ii) upon
13 occurrence of a failure on the upstream working path segment,
14 directing input traffic from an input shunt segment to the
15 downstream working path segment, and (iii) upon occurrence of a
16 failure on the downstream working path segment, directing input
17 traffic from the upstream working path segment to an output shunt
18 segment; and

19 at each backup node, (i) upon occurrence of a failure on the
20 downstream working path segment of the associated primary node,
21 directing input traffic from an input shunt segment to a
22 downstream protection path segment, and (ii) upon occurrence of a
23 failure on the upstream working path segment of the associated
24 primary node, directing input traffic from an upstream protection
25 path segment to an output shunt segment.

1 9. A method according to claim 8, further comprising at each
2 backup node, upon occurrence of a failure of the associated
3 primary node, directing input traffic from an upstream protection
4 segment to a downstream protection path segment.

1 10. A method according to claim 8, wherein the working segments,
2 protection segments, and shunt segments comprise label-switched
3 paths.

1 11. A method according to claim 8, wherein each primary node is
2 associated with a different one of the backup nodes.

1 12. A method according to claim 8, wherein at least two of the
2 primary nodes are associated with the same one of the backup nodes
3 and interconnected thereto by corresponding ones of the shunt
4 segments.

1 13. A method according to claim 8, wherein each primary node is
2 directly connected to the associated backup node without any
3 intervening nodes capable of terminating network segments.